

Columbella mercatoria L.

A few shells from Man of War Keys. On the mainland nothing but fragments were ever found.

Columbella (Anachis) varia Sowb.*Columbella (Anachis) lyrata* Sowb.

Both these forms can be found in large quantities at Wounta Haulover, but always, so far as I remember, as hermit-crab shell. I do not recall ever getting any alive, possibly because I never dredged for them. Every September, for 4 years, my boys and I collected hundreds of them. There is no doubt in my mind that both forms can be had alive not far from the Wounta Haulover beach. If I had known at the time that this was a new locality for *C. varia*, I would have made an effort to secure living specimens.

Engina turbinella Kiener.

Man of War Keys. Two specimens.

Cancellaria reticulata L. Wounta Haulover.

Have also seen it from the keys.

Terebra cinerea Gmel. Wounta Haulover.

Abundant, especially in September, when the sea is calm. At such times it seems to burrow nearer the surface of the sand. It is easily kept in a jar of sea-water and is quite active. Those I had in confinement spent much time creeping about on the sides of the jar like *Limnæas*, displaying their round, disk-like foot.

Terebra hastata Gmel. Same locality.

Rare. Only 3 specimens in 4 years. It probably inhabits deeper water than *T. cinerea*.

(To be Continued.)

A SECOND CONTRIBUTION TO WEST COAST CONCHOLOGY—II.

BY HENRY HEMPHILL.*

I have seen it stated several times by writers on conchology, that in regions where limestone predominates in the geological formation, and consequently becomes the principal element of the soil, that snail shells were or are more abundant (and hence a greater amount

* By typographical error the date of discovery of the islands was given as 1852 on p. 6 of last number, 5th line from top. It should read 1542.

of that form of organic life exists) than in regions where limestone was absent.

I am not prepared to confirm or deny such statements, for I have found land shells, both large and small, white and almost black, banded and bandless, with all the intermediate states and conditions, abundant and rare in limestone regions, and equally as abundant, rare and variable where limestone was apparently absent. There is undoubtedly a very close relationship between organic life, its form, and the elements composing the soil, which all creatures eat as food in a more refined state, and the elements composing the atmosphere that we breathe into our lungs and blood and which becomes a part of our body and being, and both of which are absolutely necessary to the existence of all forms of life, including man.

I think, therefore, we must seek for a solution of the problem of the origin of organic life, and the great diversity of form and action it presents for our study and consideration, in the chemical combination of the elements, for it is certainly true as Tyndall tells us, that "all matter is alive." In fact matter is the home of life, it is found nowhere else. Both are necessary to a demonstration of any kind, inseparable and truly immortal twins.

In his *Essay on Man*, the greatest of all philosophical poems, Pope expresses this thought in these inspired words :

" See matter next with various life endued,
 Press to one centre still the general good.
 See dying vegetables life sustain ;
 See life dissolving vegetate again :
 All forms that perish other forms supply
 (By turns we catch the vital breath and die).
 Like bubbles on the sea of matter born,
 They rise, they break, and to that sea return.
 Nothing is foreign ; parts relate to whole.
 One all-extending, all-preserving soul
 Connects each being the greatest with the least.
 Made beast in aid of man, and man of beast,
 All served, all serving, nothing stands alone.
 The chain holds good where it ends unknown."

For all of the above reasons Mr. Smith's arrangement and analysis of the rocks of Santa Catalina Island, as given in our preceding paper, may be useful to those interested in this phase of the study of life.

The topography of Santa Catalina Island is bold and rugged. In many or most places the bluffs rise abruptly out of the sea in perpendicular masses several hundred feet in height; occasionally they are lower and assume the form of wall-like buttresses or small rounded headlands jutting out more or less into the sea, back of which the land rises in steep, abrupt elevations more or less broken, to the general level of the main bluff. The summits of the bluffs are sometimes jagged and rough, occasionally rounded off more or less smooth or level, intersected by small gulches, and a few deep canyons. The surface of the interior back of the bluffs gradually rises and is diversified as all mountainous regions are, and stretches off to the foot of "Black Jack," a cone with its peak 2,000 feet high, and "Orizaba" or "Brush Mt.," ridge-like in form with its highest elevation 2,100 feet above the level of the sea. These two peaks are the highest on the island, and are located about its centre. They are a mile or more apart and stand dome-like on the main ridge, which has an average elevation above the sea of about 1,400 feet.

The main canyons, which are few in number, are narrow and deep. The beds of these great washouts rise but a few feet above sea level for a mile or two inland, where they divide into smaller gulches that rise rapidly into and drain the higher slopes of the main ridge or backbone of the island.

At the mouth of Silver Canyon, which is really the only washout I saw on the island worthy of the name canyon, there is an immense and grand bluff of volcanic rock that rises perpendicular to almost or quite the level of the main ridge of the island, and crowds the mouth of the canyon into a narrow gorge but a few feet in width, forming a grand mass of "lava flow" for study and contemplation. This canyon is located on the south side of the main ridge about 7 miles from Avalon. The bluff stands on the east side of the canyon, extends a short distance inland, where it becomes broken into steep rocky declivities and abrupt slopes, covered with a thin coating of soil, and overrun by scrubby bushes, cactus and other plants, all mingled together in wild confusion, barring out in most places the foot of man. The smaller or side gulches that drain into and intersect the main canyons are numerous, generally short, and sometimes quite deep and canyon-like, with steep sides, and separated by sharp, narrow, barren, rocky ridges that run off in every direction like the arms of an octopus, joining the main ridge higher up and near the

middle of the island. On these rocky ridges, which are generally free from brush and chaparral, one may find rough trails, or get along by some rough climbing in his search for specimens, if he has a pair of stout legs and strong hob-nailed brogans under him. The only wild creatures that inhabit these islands to-day, so far as my knowledge goes, are wild goats (introduced with sheep), wild hogs (introduced and found to-day only on Santa Cruz and Santa Rosa Islands), foxes, mice, birds, lizards, snakes (rare), snails and insects. I have no evidence to show that any other animals except the Indians ever did inhabit them; but there are reports of the discovery of the bones of some large creature on Santa Rosa Island some years ago by Dr. Yates.

The northern and more shaded slopes of these island ridges are for the most part covered with scrub-oak bushes and other chaparral of various kinds, their branches low and reaching the ground, the twigs interwoven in many places so that all travel through this tangled wildwood is shut out except an occasional place where the sheep and goats have browsed off the lower twigs and made narrow openings or rough trails in their search for food during the dry season, or in seeking cool, shady retreats during hot summer days. Cacti have nearly full possession of the south and sunny slopes or exposures of the ridges on the island, and here on Santa Catalina, so far as my experience goes, is the breeding ground and home of the various kinds of snails, while the north and more shaded slopes are destitute or deserted by these children of the mist.

Notwithstanding the thin, scanty soil in most places on the steep slopes and narrow rocky ridges, the cactus secures a tolerably firm hold by sending strong, wiry roots down into the cracks and crevices of the bedrock, and in spite of the long dry weather during the summer they succeed wonderfully in developing their stout, succulent and curious forms.

Sometimes these plants are isolated, but generally they grow in dense patches and frequently take full possession of ridge, hill and slope where they stand in great masses, and apparently the more crowded they are the larger and stouter they grow, and armed as they are, with long, sharp thorns and thousands of fine needle-like "pointers" barbed to the end, one must work among them in his search for specimens with great care, otherwise he may receive some painful stabs and wounds which I have frequently met with in my

eagerness to secure some prize that imagined it was safe when within a "crown of thorns."

A few of the main creeks and sluiceways are shallow, broad and open, and cannot be classed as canyons. Their creek-beds are sometimes bordered by small, narrow flats or slopes, with a background of smooth rolling hills and sunny declivities that become more abrupt, rocky and broken as they rise and join the main ridge. On some of these little flats, directly along the banks of the creek, there are occasional patches of small willows, intermingled with bushes and shrubs of various kinds. On the southern sides of these open creeks or sluiceways the land generally rises more abrupt and rapidly than on the opposite side, is more rugged and is densely clothed with the impenetrable chaparral, mingled frequently with cactus, and presenting rather a strange contrast to the barren, treeless and shrubless slopes on the opposite side of the creeks.

The aspect of these islands during the dry season is dreary enough, and yet, even then, there is a sort of melancholy charm about the scenery, especially to those who want to see and study old mother nature in all her moods, which are about as changeable and fickle as her greatest offspring, the genus *Homo*.

The brown and sere vegetation, the barren and dried-up soil, ridge and slope strewn with fragments of disintegrating ledges of vari-colored rocks, the dumb waterless streams that sing no song and produce no "speckled beauties" to the great disgust of the enthusiastic "fly-throwers," and the hazy atmosphere that frequently hangs like a veil over hill and mountain, and lends a dim, distant and dreamy appearance to the landscape, are conditions not calculated to excite our enthusiasm, and leaves the imagination about as barren of glow as the landscape is of flowers and green grass. With the advent of the wet or rainy season however, all this dreariness is changed and so quickly that one wonders at the sudden transformation of the landscape from a dreary desert waste to a beautiful blooming garden wrought by the magic chemistry of the rains and dews upon the dry, warm earth.

Perhaps in no other part of our blessed republic is there so sudden and rapid a transition in the growth of vegetation, and hence in the general aspect of the landscape, as occurs in Southern California, after the heavy rains fall and the ground becomes well saturated with moisture. I know of no better fact that illustrates so well the

effect of conditions in the environment, not only on vegetable but on all other forms of life as the application of moisture to the warm dry soil, and I may add right here, that in my opinion the proportions of heat and moisture, especially in the early stages of growth of an organism, is probably the most fruitful source of variation.

The rains of Southern California appear to be brewed in the south, at least they are brought here on the wings of the south wind. When the rains are excessive, the gulches, creeks and canyons on these islands become raging torrents; the thin soil in many places, and especially on the south slopes which receive the full force of the storms, becomes filled with water to the bedrock; then landslides more or less extensive occur, when rock, land and cactus are launched into the raging waters and carried out to sea.

With these destructive occurrences whole colonies of snails are frequently carried away and destroyed, except occasionally a few fortunate individuals that may become stranded with other débris lower down on the sides of the creek or canyon, where if the conditions are favorable a new colony will spring up with such modification of the creature and the shell as the combination of the already organized creature and the new conditions in the environment determine.

(To be Continued.)

PUBLICATIONS RECEIVED.

THE FOSSIL LAND SHELLS OF BERMUDA. By Addison Gulick (Proc. Acad. Nat. Sci., Phila., 1904, pp. 406-425, plate 36). The shells collected by the author from quarries of the æolian limestone of Bermuda are described and discussed in this valuable paper. Of 17 species of land snails found fossil, 14 are probably peculiar to Bermuda. The recent fauna contains 13 indigenous species, 6 of them peculiar to the island. The most notable of the fossils discovered by Mr. Gulick are new species of *Pæcilozonites*, *Euconulus*, *Zonitoides*, *Vertigo* (2 species), *Carychium* and a *Strobilops* referred to *hubbardi*. "Dr. Pilsbry's conclusion, from the anatomy of *Pæcilozonites*, that the oldest importations to Bermuda came from continental America, is thus confirmed by a large majority of the fossil forms." Some of the commonest species in the modern fauna are wanting in the fossil deposits, such as *Polygyra microdonta* and *Helicina convexa*. Mr. Gulick gives an interesting discussion of the condition of the island at the time the extinct forms flourished, too long for abstract here.—H. A. P.